Claim 25 recites "a process for fabricating a semiconductor device, comprising the step of: bonding a semiconductor device to a support with an organic die-bonding film at conditions of temperature of 100-250°C and pressure of 0.1-30 gf/mm^2 to produce a bonded chip wherein the organic die-bonding film has a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher." The improvement is "bonding a semiconductor device to a support with an organic die-bonding film at conditions of temperature of 100-250°C and pressure of 0.1-30 gf/mm^2 to produce a bonded chip wherein the organic die-bonding film has a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher."

The Examiner points out that the Morita et al. reference (U.S. Patent 5,406,124) teaches adhesive tape having a maximum 90-degree peel strength of 67 g/10mm^2 (col. 17, line 13 to col. 18, line 10, and Table 1, embodiment No. 13). The Examiner ignores that the adhesive tape of Morita's embodiment No. 13 is cut to 10 mm^2 size pieces, then bonded to a Si chip under the conditions of temperature of 380°C and pressure of 20 kg/cm^2, which appears to be a different set of bonding conditions than recited in Applicants' claim 25. Furthermore, Morita's embodiments Nos. 1-24 suggest that each different adhesive tape embodiment must be subjected to a proper set of temperature and pressure conditions in order to achieve adhesive bonding as illustrated in Table 1. Therefore, it is not a simple matter of choosing bonding conditions when given a specific adhesive tape because proper adhesion may not occur without the proper set of bonding conditions. The bonding conditions of the present claims are extremely low in temperature and pressure, while the peel strength is extremely high. There is absolutely no suggestion in Morita that satisfactory results could be obtained with the low temperature and pressure claimed. In fact, Morita, on its face, teaches against the claimed conditions.

In the present invention, the process for fabricating a semiconductor device as recited in claim 25 relies upon an organic die-bonding film, such as disclosed in Table 7 of the instant specification, that achieves a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher when bonded under the conditions of temperature of 100-250°C and pressure of 0.1-30 gf/mm^2 to produce a bonded chip. As stated above, Morita et al. actively teaches against the fabrication process recited in claim 25.

Response to 37 C.F.R. §105 Requirement

Applicants know of no conversion factor to convert the 90-degree peel strengths disclosed by Morita et al. to the 17-degree peel strengths used for testing purposes in the present invention (see Figure 2, and page 30, line 22 to page 31, line 8, of the instant specification). The issue is clouded further by the fact that the Morita et al. reference does not clearly describe how the 90-degree peel strength was measured. Assuming that Morita et al. measured 90-degree peel strength in the normal manner, the test would be measuring the adhesive force when the adhesive is peeled off the adherend in the vertical direction (normal to the surface of the adherend). The 90-degree peel strength is a measurement of the "linear adhesion strength" and is conventionally measured in units of Kg/m.

On the other hand, 17 degree peel strength as measured in accordance with the method described in the present specification is a measurement of "areal adhesion strength" and is measured in units of Kgf/5mm x 5mm chip. Thus, there is no conversion factor for converting results of these two different tests that test different adhesive properties and report results in different non-convertible units.

However, the Masuko Declaration shows in Table 1 that under the die-bonding temperature and pressure conditions set forth in claim 25 adhesive films made in accordance

with the teachings of the Morita et al. reference attain a 17-degree peel strength of 0.4 Kgf/5mm x 5 mm chip or less, whereas the adhesive films of the present invention attain 17-degree peel strengths of 0.55 Kgf/5mm x 5 mm chip or higher. Thus, it is shown that the stronger areal adhesive strengths of the organic die-bonding films of the present invention do not overlap with the weaker areal adhesive strengths of adhesives made in accordance with Morita et al. reference.

The Matsuko Declaration

The Matsuko Declaration contains objective experimental evidence commensurate in scope with the claims that shows both superior and unexpected results regarding the areal adhesive strength of the adhesive film of the present invention compared to the adhesive film disclosed by the Morita et al. reference. Specifically, Table 1 on page 5 of the Matsuko Declaration tabulates experimental data collected by testing 17-degree peel strength of adhesives made in accordance with the Morita et al. reference (Matsuko Declaration, page 3, lines 3-16) and adhesives made in accordance with the present invention (Matsuko Declaration, page 3, line 17 to page 4, line 9).

The temperature and pressure bonding conditions of the organic die-bonding film of the present invention are commensurate in scope with the temperature and pressure bonding conditions recited in claim 25. Furthermore, the 17-degree peel strengths achieved by the organic die-bonding film made in accordance with the present invention are also commensurate in scope with the "peel strength of 0.5 Kgf/5mm x 5mm chip or higher" as recited in claim 25.

However, when the adhesive film made in accordance with the teachings of the Morita et al. reference were tested under temperature and pressure bonding conditions commensurate in scope with claim 25, Morita's adhesive film was not able to achieve 17-degree peel strengths

higher than 0.4 Kgf/5mm x 5 mm chip. Therefore, the adhesive film of Morita et al. is not able to teach, or even to suggest, the subject matter of claim 25.

The superior result is that the areal adhesive strength of the organic die-bonding film of the present invention is able to attain 17-degree peel strengths of 0.5 Kgf/5mm x 5mm chip or higher, whereas the adhesive film taught by the Morita et al. reference is only able to attain 17-degree peel strengths of 0.4 Kgf/5mm x 5mm chip or lower. The unexpected result is that, as shown in Table 1, when the die-bonding conditions of temperature at 250°C and pressure of 30 gf/mm^2 were selected, the areal adhesive strength of the organic die-bonding film of the present invention was so strong that the chips all broke apart before the die-bonding film gave way. In other words, the die-bonding film was stronger than the chips themselves, which is a truly remarkable and unexpected result!

Conclusion

Applicants have satisfied the requirement under 37 C.F.R. 1.105 to provide the Examiner with additional information directed to identifying what is being improved. Applicants have also clearly shown that the experimental evidence submitted in the Matsuko Declaration in accordance with 37 C.F.R. 1.132 is commensurate in scope with independent claim 25 and demonstrates both superior and unexpected areal adhesive strength over the closest prior art adhesive film.

For all of the above reasons argued in additional support of Amendment (B), claims 25-65 are in condition for allowance, and prompt notice of allowance is earnestly solicited.

Questions are welcomed by the below-signed attorney for applicants.

Respectfully submitted,

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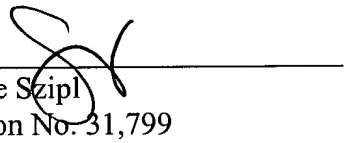

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